Deep Space Network Operations and Maintenance

Request for Proposal

Industry Briefing

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National Aeronautics and
Space Administration

JPL

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Program Overview
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Topics

- Purpose and Scope of DSMS
- Program Overview
- DSMS Characteristics
- DSMS Facilities
- DSMS Mission Set
- External Interfaces
- Process Map
- Organization Chart
- The Vision
- The Interplanetary Network

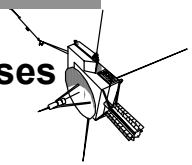
Purpose and Scope of DSMS

- The overall purpose of the Deep Space Mission System (DSMS) Program is to enable OSS missions by providing:
  - Cost-effective and reliable telecommunications services
  - Cost-effective and reliable mission-operations tools, services, and engineering support
  - Extensions of telecommunications and mission-operations capabilities
    - End-to-end (flight, ground, and link)
    - Portions of an interplanetary network
  - New technologies for telecommunications and mission operations
  - Must lead the mission set - not follow it!
- The primary architectural components of DSMS include:
  - The Deep Space Network (DSN) and the
  - Advanced Multi-Mission Operations System (AMMOS)

Program Overview

The DSMS Provides Services and Tools to Flight Projects

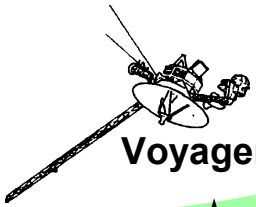
Spacecraft/ Radio Sources



Mars Spacecraft

ISTP

SIRTF



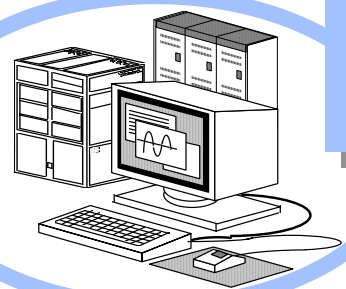
Chandra

Flight Projects

- Mission Operations

The Deep Space Network (DSN)

- TT&C Services
- Science Observations



Advanced Multimission Operations System (AMMOS)

- GDS Tools
- Mission Services

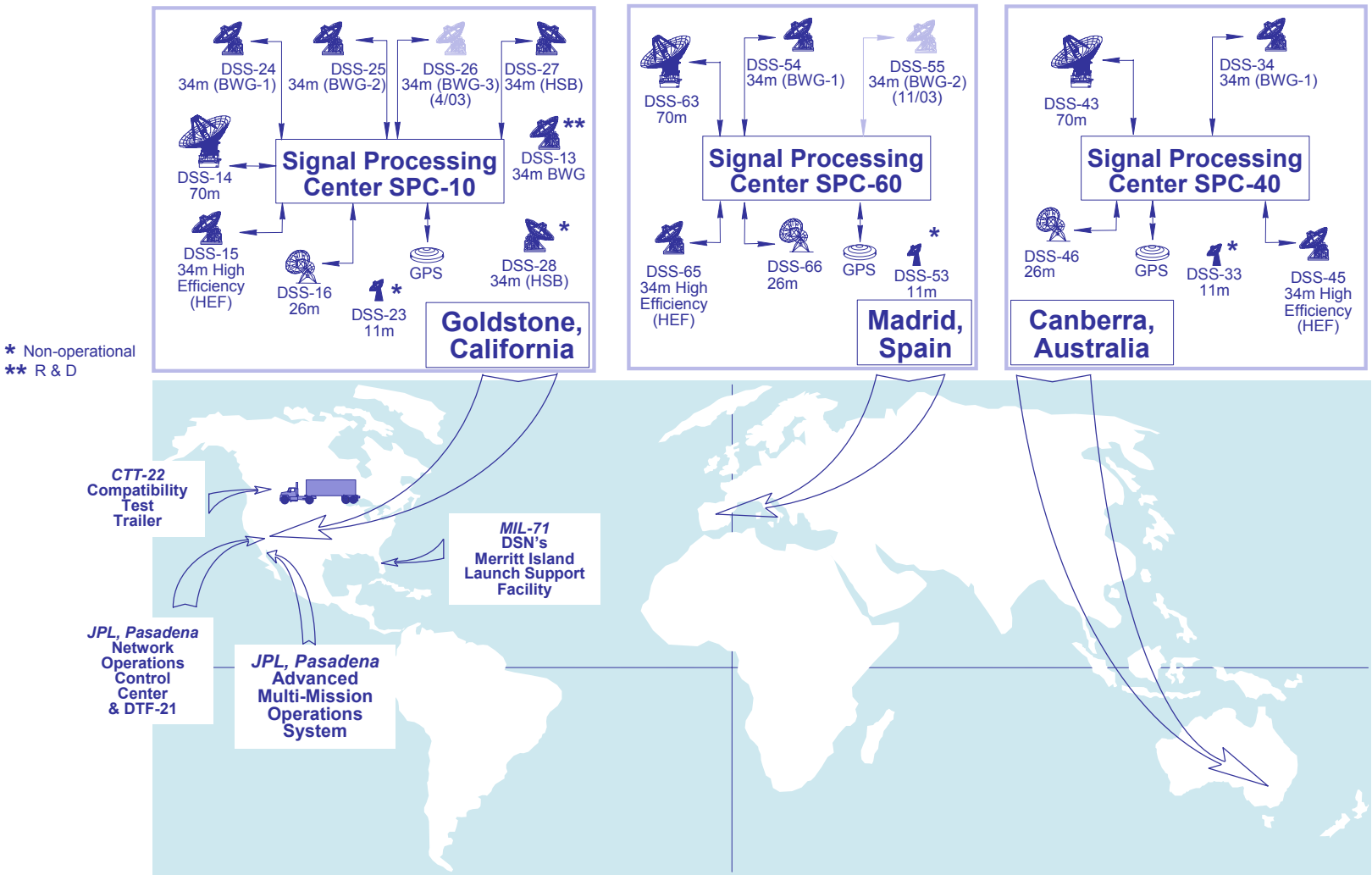
DSMS Characteristics

- DSMS provides services, tools, and engineering support to:
  - 35 to 40 active missions per year
  - 30 to 50 planning interfaces per year
- Must maintain a 10 to 20-year planning horizon
  - Support full life cycle
    - Concept
    - Technology
    - Design
    - Development
    - Operation
    - Phase-out

DSMS Characteristics (Cont'd)

- Sustain legacy mission support while evolving for new missions
  - Must be maintained as a precision calibrated instrument
  - Compounding number of interfaces
- Always on – available 24 x 7 to support missions
- Geographically distributed
  - Multiple U.S. and overseas locations
    - Some sites operate as small towns – self-contained infrastructure
  - Government-to-Government treaties
- Multiple funding interfaces

DSMS – World Wide Facilities



DSN Facilities – Deep Space Communications Complexes

Madrid
Operated by INSA for INTA

Goldstone
Operated by CSOC for NASA/JPL

Canberra
Operated by BAE Systems for CSIRO

DSN Facilities (Cont'd)

- Other Contractor-operated DSN facilities include:
  - MIL 71: located at MILA; staffed as required for spacecraft compatibility verification and pre-launch testing
  - DTF 21: located at Bldg. 605 just south of JPL; supports compatibility testing and development testing
  - CTT 22: a mobile compatibility test trailer; supports RF and data compatibility tests
  - Central Communications Terminal: Bldg. 230; provides voice and data communications interconnections
  - Deep Space Operations Control Center: Bldg. 230; provides support data and technical information to the DSCCs and projects and to process data for delivery to projects
  - Remote Operations Support Area: at Bldg. 507 (CSOC Facility); supports mission critical events
  - DSN Logistics Facility: at Bldg. 504 (CSOC Facility); supports modkit handling, inventory and shipping/receiving, and vendor repair

Approved Mission Set: DSN Supports*

LEGACY LEO

- RADARSAT (O)

LEOP**

- GOES N-Q (C)
- NOAA , N, N' (C)
- TDRS J (C)
- PROSEDS (C)
- SOLAR-B (F)

HEO, Lunar, L1 & L2

- CHANDRA (O)
- MAP (O)
- INTEGRAL (O)
- ISTP-GEOTAIL (O)
- ISTP-WIND (O)
- ISTP-SOHO (O)
- ISTP-POLAR (O)
- ACE (O)
- IMAGE (O)
- ISTP-CLUSTER II (O)
- GENESIS (O)
- LUNAR-A (F)
- SELENE (F)
- ST-5 (C)

DEEP SPACE***

- GALILEO (O)
- MARS GLOBAL SURVEYOR (O)
- CASSINI (O)
- NOZOMI (O)
- STARDUST (O)
- 2001 MARS ODYSSEY (O)
- GSSR (O)****
- MUSES-C (C), (F per MSD)
- MARS EXPRESS (C)
- MARS EXPLORATION ROVERS A & B (C)
- ROSETTA (C)
- DEEP IMPACT (C)
- MESSENGER (C)
- MARS RECONNAISSANCE ORBITER (C)
- DAWN (C)
- MARS SCOUT (F)
- MARS PREMIER/NET LANDERS (F)
- MARCONI (F)
- MARS SCIENCE LABORATORY (F)
- NEW FRONTIERS (F) (X)
- GRAVITY PROBE B (O)****
- EVN (O)****
- GBRA (O)****
- MEGA (O)****
- SIRTF (C)
- KEPLER (C)
- SIM (F)
- VOYAGERS 1 & 2 (O)
- ULYSSES (O)
- STEREO A & B (C)
- PN10-TECH (O)
- ORBITAL DEBRIS (O)
- SPACE GEODESY (O)
- DISCOVERY (F) (X)
- MIDEX (F) (X)
- NMP (F) (X)

NOTES

*~21 additional spacecraft fall under "Emergency Support Only" and are not shown.

**LEOP = Launch & Early Operations Phase; almost all DSN missions receive such support, but those listed as "LEOP" receive no other significant DSN support.

***Deep Space includes missions utilizing Earth leading and trailing orbits, since spacecraft in such orbits drift out well beyond Lagrange point distances.

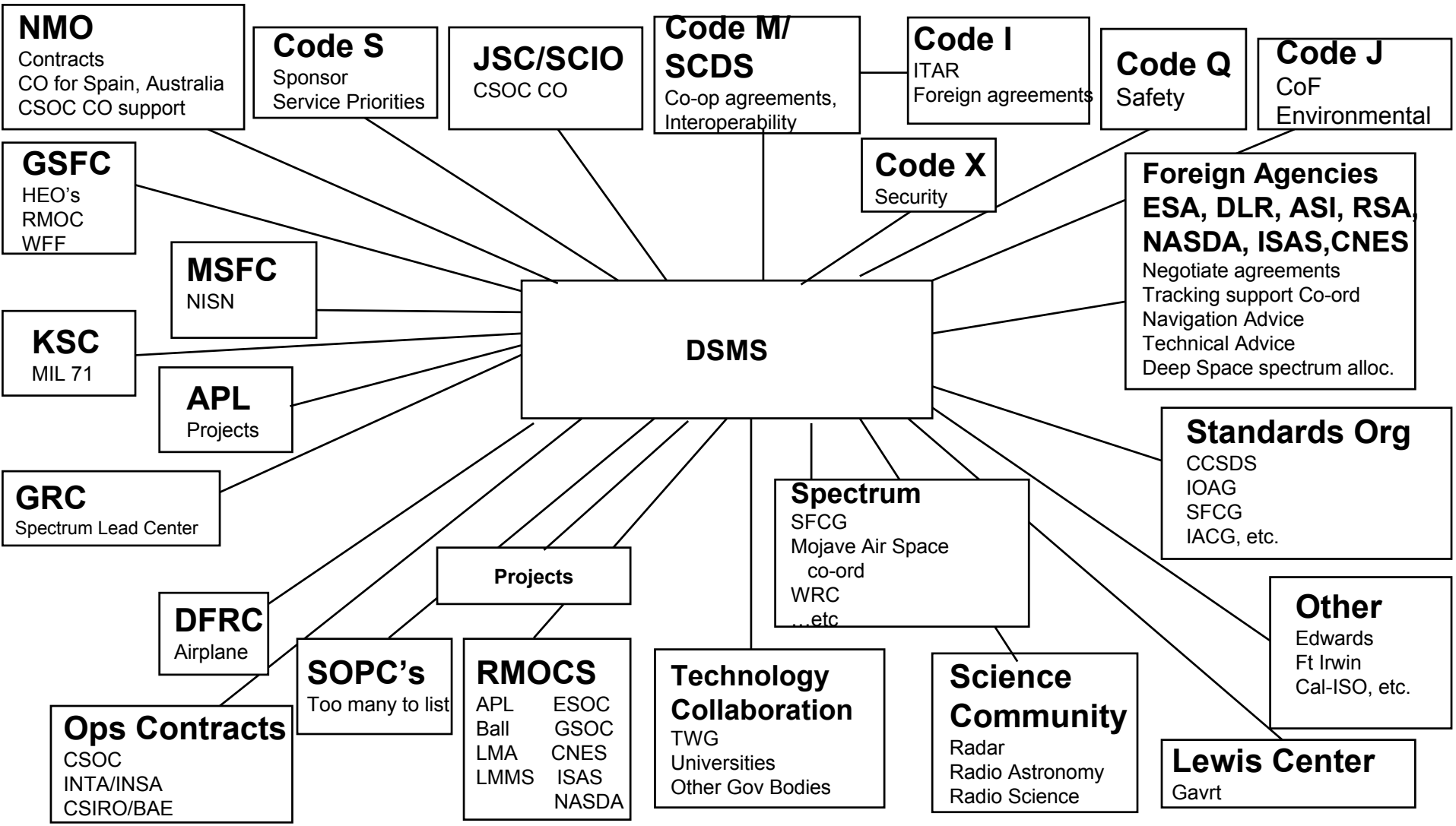
****Support assumes the form of ground-based observations for mission reference ties (e.g., GP-B), VLBI co-observations, radio astronomy, solar system radar, or orbital debris.

KEY

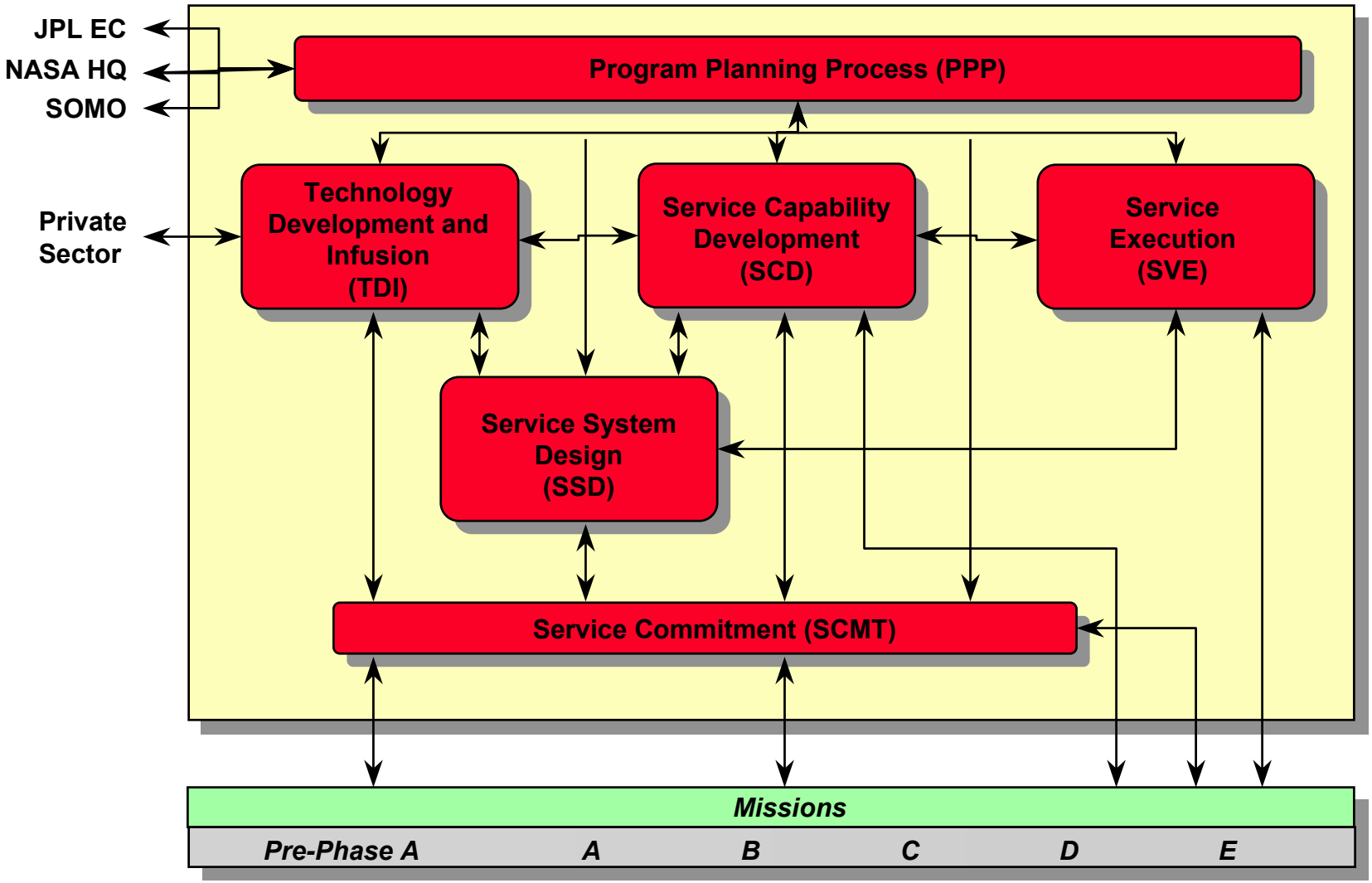
- Structure & Evolution of Universe Theme
- Astronomical Search for Origins Theme
- Exploration of the Solar System Theme
- Sun-Earth Connection Theme
- Cross-Theme Affiliation
- Unaffiliated with Space Science Enterprise

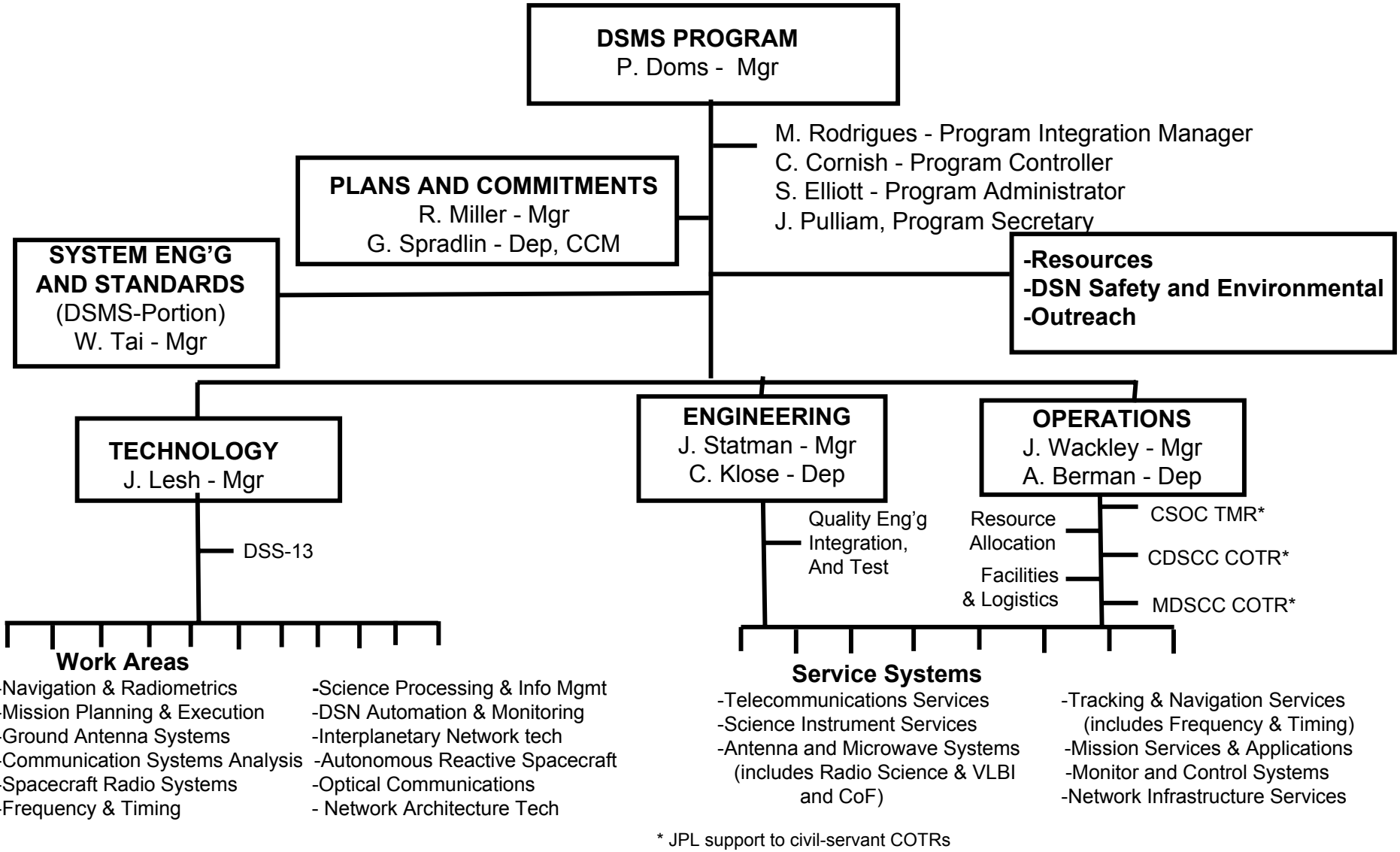
(O) = Operating (as of 1/03)
(C) = Commitment to support, but not yet operating (as of 1/03)
(F) = Future commitment to support anticipated (as of 1/03)
(X) = Not specifically called out in Code S approved "Mission Set Database" or "Mission Set Change Log"

External Interfaces



DSMS Process Map





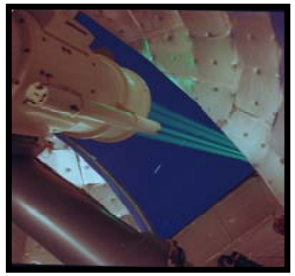
* JPL support to civil-servant COTRs

The Vision

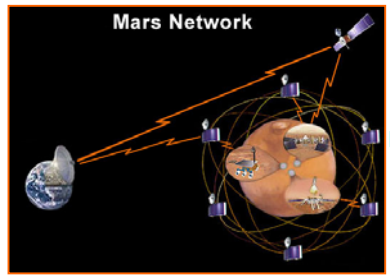
Build the Interplanetary Network Backbone

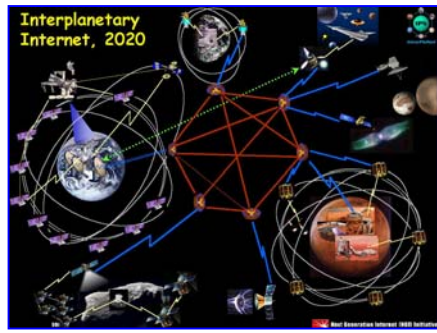
Modernize DSN

Pioneer Optical Comm



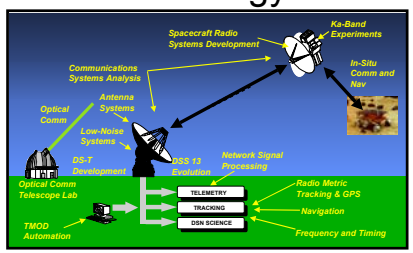
Network Space Comm Assets





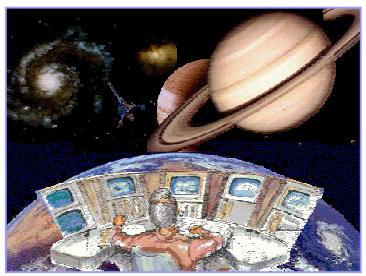
Interplanetary Network

Technology

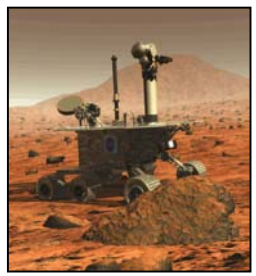


- Standards & Protocols
- S/C Comm Components
- RF & Optical
- Mission Operations

Develop the Tools & Techniques Needed to Operate with this Backbone

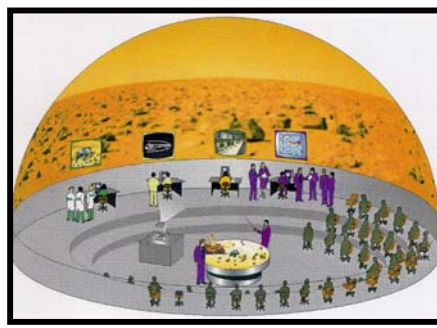


Provide Core Multi-Mission Ops Systems & Software



Revolutionize Mission Operations

Advance Mission Design & Nav



The Interplanetary Network

The public, scientists and flight projects

The Solar System

Web Applications:
- Web-based visualization and telepresence

- Plug-'n-Play Instrument interfaces

End-To-End Mission
- Messaging services
- Information Management

Operations Services:
- Tracking
- Navigation
- Flight control
- Timing

IPN Network Management

Terrestrial Networks
- End-to-End Network Management

Interplanetary Backbone Network
- DSN - 34m, 70m & equivalent
- DSN - Large RF Arrays
- DSN - Optical Communications
- Deep space links - trunk lines

In-situ Networks
- Mars Network
- Surface networks
- Onboard spacecraft networks
- Proximity networks

End-to-End Protocols | Long haul protocols | Short haul protocols